



## ***Improved Air Transportation Safety***

### ***Critical Infrastructure Surety***

#### **The Challenges**

The United States has the world's largest, busiest, most diverse, and most complex air transportation system. It has evolved over the past half century to incorporate amazing advances in technology; but, it may not be optimally configured to meet the challenges of growth and security in the next half century which will see new technologies fielded at an ever increasing rate. These challenges will have a major impact on design, manufacturing, maintenance, aircraft operations, air traffic control, personnel, information systems, and organizations.

As the number of aircraft in service continues to increase, so will the number of older aircraft. Understanding the safety issues of operating and repairing older aircraft and finding more effective

and efficient methods to assess the continuing airworthiness of all aircraft are an integral part of achieving the safety and reliability objectives established for the U.S. air transportation system.

An unfortunate fact of modern life is that high value targets such as those routinely used in aviation have become terrorist targets. Air travel cannot be as safe as we desire unless we successfully counter this threat.

#### **Toward Improved Aviation System Safety**

The challenges are diverse and complex, and the stakes are high: the public's long-term confidence in safe, affordable, reliable air transportation.





*B737-200 testbed at the AANC*

Several reports, including *The White House Commission on Aviation Safety and Security Final Report, Challenge 2000*, and the Federal Aviation Agency (FAA) *90 Day Safety Review* pointed out the need for changes to the existing system. New technologies bring the promise of vastly increased capabilities, but technology alone will not be sufficient to provide the required improvements. Providing desired safety margins for advanced aircraft with highly coupled, software-intensive systems operating in the high-volume aviation environment of the future is a difficult challenge. It will require applying an integrated system-engineering process leading to implementing system-level process changes coupled with carefully selected technological enhancements. Sandia is actively involved in partnerships with the Departments of Defense and Transportation, industry, and academia to address these varied issues. Sandia's long experience as a systems laboratory tasked with engineering and ensuring the safety, security, and reliability of very high consequence systems (nuclear weapons and power systems) coupled with our broad expertise

in engineering and science, human factors, information systems, and aviation safety provide a unique capability to assist FAA and the aviation industry in preparing for the future. To this end, we are involved in several complementary projects.

### **Airworthiness Assurance Non-Destructive Inspection Validation Center (AANC)**

Beginning with the 1988 Aviation Safety Act, airworthiness assurance has been a key effort at Sandia. Initially focused on the structural problems of aging aircraft, the program has grown to include developing and validating new, improved inspection, maintenance, and repair technologies and deploying them to civil and military users. In recognition of Sandia's exceptional contributions and capabilities, the FAA created the AANC, located at our Albuquerque, New Mexico, site and managed by Sandia. The Center promotes aviation safety through

- improved technology and procedures (system-level perspective)
- independent validation and faster transfer and deployment of new technologies
- continuing refinement and comparison of inspection and repair techniques
- cost savings through centralization, and
- leveraging multiple programs

### **Aviation Safety Decision Support Program**

This program and the aviation industry explicitly recognizes that the FAA is a knowledge-based enterprise. Knowledge is a critical element in the

processes of making decisions to enhance safety. Sandia is involved in several elements supporting both AVR (Regulation and Certification) and AAR (Office of Aviation Research) and the air transportation industry, including:

- improved oversight processes
- improved, proactive system-level safety strategies
- data-driven, risk-based, defensible decision processes
- improved data quality taking into account information systems architecture, and
- identification and collection of correct and useful data, analysis, and human factors in data collection



*The Airworthiness Assurance Non-destructive Inspection Validation Center (AANC), located at the Albuquerque International Airport.*

## Airport Security

Airports are attractive targets for terrorists because of the intrinsic high value of the facilities and the people, and the shock value of a successful attack. The gruesome nature of terrorist attacks, our limited ability to defend against them, and the small quantity of explosives required are cause for serious concern. Sandia developed and tested a prototype non-intrusive explosive detection portal and portable detection equipment which, if deployed in adequate numbers, shows great promise at detecting very small quantities of explosive residue on both baggage and passengers.

## Agility, Versatility, Utility

Sandia's philosophy is to apply our expertise with high-consequence systems and operations to national issues involving transportation safety and security. We are able to quickly form multi-disciplinary teams to address key problems across the transportation spectrum and to form partnerships with industry, government, and academia as appropriate to meet the customer's needs.



*Explosives detection portal prototype*

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